IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1.   (Previously Presented) A data processing device comprising:

an improvement information generating unit adapted to generate improvement information for improving quality of data ; and

an embedding unit adapted to embed a plurality of types of improvement information into the data, wherein the improvement information generating unit generates the plurality of types of improvement information for converting the data into a plurality of qualities, and

wherein the embedding unit embeds the plurality of types of improvement information into the data so that the data and the improvement information can be restored.

2.   (Previously Presented) The data processing device as claimed in claim 1, wherein the improvement information generating unit generates a prediction coefficient used for predicting a prediction value of quality-improved data obtained by improving the quality of the data, as the improvement information.

3.   (Previously Presented) The data processing device as claimed in claim 2, wherein the

improvement information generating unit generates the prediction coefficient for each

predetermined class.

4.   (Previously Presented) The data processing device as claimed in claim 3, wherein the

improvement information generating unit comprises:

    a class tap constructing unit adapted to construct a class tap used for finding a class of

target teacher data of teacher data to be a teacher, by using learner data to be a learner;

    a classifying unit adapted to carry out classification for finding the class among the target

teacher data on a basis of the class tap;

    a prediction tap constructing unit adapted to construct a prediction tap used together with

the prediction coefficient for predicting the target teacher data, by using the learner data; and

    a prediction coefficient operation unit adapted to find the prediction coefficient for each

class by using the teacher data and the prediction tap.

5.   (Previously Presented) The data processing device as claimed in claim 4, wherein the

improvement information generating unit generates a plurality of types of improvement

information.

6. (Previously Presented) The data processing device as claimed in claim 5, wherein the improvement information generating unit generates prediction coefficients for different number of classes as the plurality of types of improvement information.

7. (Previously Presented) The data processing device as claimed in claim 5, wherein the improvement information generating unit generates a plurality of types of prediction coefficients found by using learner data or teacher data of different qualities, as the plurality of types of improvement information.

8. (Previously Presented) The data processing device as claimed in claim 5, wherein the improvement information generating unit generates at least the prediction coefficient and information for carrying out linear interpolation, as the plurality of types of improvement information.

9. (Previously Presented) The data processing device as claimed in claim 5, wherein the improvement information generating unit generates a plurality of types of prediction coefficients found by using class taps or prediction taps of different structures, as the plurality of types of improvement information.

10. (Previously Presented) The data processing device as claimed in claim 5, wherein the improvement information generating unit generates a plurality of types of prediction coefficients

found by carrying out classification by different methods, as the plurality of types of

improvement information.

11.   (Previously Presented) The data processing device as claimed in claim 1, wherein the

improvement information generating unit generates, as the improvement information, a class

code expressing the class of the data, used for predicting the prediction value of the quality-

improved data obtained by improving the quality of the data.

12.   (Previously Presented) The data processing device as claimed in claim 11, wherein the

improvement information generating unit comprises:

        a prediction tap constructing unit adapted to construct a prediction tap used for predicting

target teacher data of teacher data to be a teacher, by using learner data to be a learner;

        a prediction coefficient storage unit adapted to store a prediction coefficient for each

class code found by learning;

        a predictive operation unit adapted to find a prediction value of the target teacher data by

using the prediction tap and the prediction coefficient; and

        a class code detecting unit adapted to detect the class code of a prediction coefficient that

minimizes the prediction value of the target teacher data; and

        wherein the improvement information generating unit outputs the class code detected by

the class code detecting unit, as the improvement information.

13.   (Previously Presented) The data processing device as claimed in claim 11, wherein the

improvement information generating unit comprises:

a class tap constructing unit adapted to generate a class tap used for finding the class of

target teacher data of teacher data to be a teacher, by using the teacher data; and

a classifying unit adapted to carry out classification for finding the class of the target

teacher data on the basis of the class tap; and

wherein the improvement information generating unit outputs a class code corresponding

to the class found by the classifying unit, as the improvement information.

14.   (Previously Presented) The data processing device as claimed in claim 1, wherein the

embedding unit embeds the improvement information into the data so that the data and the

improvement information can be restored, by using a bias of energy held by the data.

15.   (Previously Presented) The data processing device as claimed in claim 1, wherein the

embedding unit embeds the improvement information into the data by carrying out spectrum

spreading.

16.   (Previously Presented) The data processing device as claimed in claim 1, wherein the

embedding unit embeds the improvement information into the data by changing one or more bits

of the data to the improvement information.

17.   (Original) The data processing device as claimed in claim 1, wherein the data is image

data and the improvement information is information for improving image quality of the image

data.

18.   (Previously Presented) A data processing method comprising:

an improvement information generating step of generating improvement information for

improving quality of data; and

an embedding step of embedding a plurality of types of improvement information into the

data, wherein the improvement information generating step generates the plurality of types of

improvement information for converting the data into a plurality of qualities and,

wherein the embedding step embeds the plurality of types of improvement information

into the data so that the data and the improvement information can be restored .

19.   (Previously Presented) A recording medium having recorded thereon a program to be

executed by a computer, the program comprising:

an improvement information generating step of generating improvement information for

improving quality of data; and

an embedding step of embedding a plurality of types of improvement information into the

data, wherein the improvement information generating step generates the plurality of types of

improvement information for converting the data into a plurality of qualities and,

wherein the embedding step embeds the plurality of types of improvement information

into the data so that the data and the improvement information can be restored.

20.   (Cancelled)

21.   (Currently Amended) A data processing device for processing embedded data obtained

by embedding a plurality of types of improvement information for improving quality of data into

the data, the device comprising:

an extracting unit adapted to extract the plurality of types of improvement information

from the embedded data, wherein the plurality of types of improvement information convert the

data into a plurality of qualities; and

an improving unit adapted to improve the quality of the data by using one of the plurality

of types of improvement information according to a user request and

wherein the plurality of types of improvement information are embedded into the data so

that the data and the improvement information can be restored.

22.   (Previously Presented) The data processing device as claimed in claim 21, wherein the

improvement information is a prediction coefficient used for predicting a prediction value of

quality-improved data obtained by improving the quality of the data, and the improving unit

finds the prediction value of the quality-improved data by using the data and the prediction

coefficient.

23.   (Previously Presented) The data processing device as claimed in claim 22, wherein the

improvement information is a prediction coefficient found for each predetermined class, and the

improving unit finds the prediction value of the quality-improved data by using the data and the

prediction coefficient for each class.

24.   (Previously Presented) The data processing device as claimed in claim 23, wherein the

improving unit comprises:

       a class tap constructing unit adapted to construct a class tap used for finding a class of

target quality-improved data, which is targeted quality-improved data, by using the data;

       a classifying unit adapted to carry out classification for finding the class of the target

quality-improved data on the basis of the class tap;

       a prediction tap constructing unit adapted to construct a prediction tap used together with

a prediction coefficient for predicting the target quality-improved data, by using the data; and

       a predicting unit adapted to find a prediction value of the target quality-improved data by

using the prediction coefficient of the class of the target quality-improved data and the prediction

tap.

25.   (Previously Presented) The data processing device as claimed in claim 21, wherein the

improvement information is a class code expressing the class of a prediction coefficient for each

predetermined class used for predicting a prediction value of quality-improved data obtained by

improving the quality of data, and the improving unit finds the prediction value of the quality-

improved data by using the data and the prediction coefficient corresponding to the class code.

26.   (Previously Presented) The data processing device as claimed in claim 25, wherein the

improving unit comprises:

        a prediction tap constructing unit adapted to construct a prediction tap used together

with a prediction coefficient for predicting target quality-improved data, which is targeted

quality-improved data, by using the data; and

        a predicting unit adapted to predict a prediction value of the target quality-improved

data by using the prediction coefficient corresponding to the class code as the improvement

information and the prediction tap.

27.   (Original) The data processing device as claimed in claim 24, wherein a plurality of

types of improvement information are embedded in the embedded data.

28.   (Original) The data processing device as claimed in claim 27, wherein the prediction

coefficients for different numbers of classes are embedded in the embedded data as the plurality

of types of improvement information.

29.   (Original) The data processing device as claimed in claim 27, wherein the prediction

coefficient is generated by using learner data to be a learner and teacher data to be a teacher, and

a plurality of types of prediction coefficients found by using learner data or teacher data of different qualities are embedded in the embedded data as the plurality of types of improvement information.

30.   (Original) The data processing device as claimed in claim 27, wherein at least the prediction coefficient and information for carrying out linear interpolation are embedded in the embedded data as the plurality of types of improvement information.

31.   (Original) The data processing device as claimed in claim 27, wherein a plurality of types of prediction coefficients found by using class taps or prediction taps of different structures are embedded in the embedded data as the plurality of types of improvement information.

32.   (Original) The data processing device as claimed in claim 27, wherein a plurality of types of prediction coefficients found by carrying out classification by different methods are embedded in the embedded data as the plurality of types of improvement information.

33.   (Previously Presented) The data processing device as claimed in claim 27, further comprising an improvement information selecting unit adapted to select improvement information used for improving the quality of the data, from the plurality of types of improvement information.

34.   (Previously Presented) The data processing device as claimed in claim 21, wherein the

extracting unit extracts the improvement information from the embedded data by using the bias

of energy held by the data.

35.   (Previously Presented) The data processing device as claimed in claim 21, wherein the

extracting unit extracts the improvement information from the embedded data by carrying out

inverse spectrum spreading.

36.   (Previously Presented) The data processing device as claimed in claim 21, wherein the

extracting unit extracts one or more bits of the embedded data as the improvement information.

37.   (Original) The data processing device as claimed in claim 21, wherein the data is image

data and the improvement information is information for improving the image quality of the

image data.

38.   (Currently Amended) A data processing method for processing embedded data obtained

by embedding a plurality of types of improvement information for improving quality of data into

the data, the method comprising:

    an extracting step of extracting the plurality of types of improvement information from

the embedded data, wherein the plurality of types of improvement information convert the data

into a plurality of qualities; and

an improving step of improving the quality of the data by using one of the plurality of

types of improvement information according to a user request and

wherein the plurality of types of improvement information are embedded into the data so

that the data and the improvement information can be restored.

39.   (Currently Amended) A recording medium having recorded thereon a program to be

executed by a computer for processing embedded data obtained by embedding a plurality of

types of improvement information for improving the quality of data into the data, the program

comprising:

an extracting step of extracting the plurality of types of improvement information from

the embedded data, wherein the plurality of types of improvement information convert the data

into a plurality of qualities; and

an improving step of improving the quality of the data by using one of the plurality of

types of improvement information according to a user request and

wherein the plurality of types of improvement information are embedded into the data so

that the data and the improvement information can be restored.

40.   (Cancelled)

41.   (Currently Amended) A data processing device comprising:

an improvement information generating unit adapted to generate a plurality of types of

improvement information for improving quality of data, wherein one of the plurality of types of

improvement information is embedded into the data, wherein the plurality of types of

improvement information convert the data into a plurality of qualities;

an improvement information selecting unit adapted to select improvement information to

be transmitted together with the data, from the plurality of types of improvement information;

and;

a transmitting unit adapted to transmit the data and said one of the plurality of types of

improvement information and,

wherein said one of the plurality of types of improvement information is embedded into

the data so that the data and the improvement information can be restored.

42.   (Previously Presented) The data processing device as claimed in claim 41, further

comprising improvement information selecting unit for selecting improvement information to be

transmitted together with the data, from the plurality of types of improvement information.

43.   (Previously Presented) The data processing device as claimed in claim 42, wherein the

improvement information selecting unit selects the improvement information in response to a

request from a receiving device which receives the data.

44.   (Previously Presented) The data processing device as claimed in claim 43, further

comprising an accounting unit adapted to carry out accounting in correspondence with the

improvement information selected by the improvement information selecting unit.

45.   (Previously Presented) The data processing device as claimed in claim 41, wherein the

improvement information generating unit generates at least a prediction coefficient used for

predicting a prediction value of quality-improved data obtained by improving the quality of the

data, as the improvement information.

46.   (Previously Presented) The data processing device as claimed in claim 45, wherein the

improvement information generating unit generates a prediction coefficient for each

predetermined class.

47.   (Previously Presented) The data processing device as claimed in claim 46, wherein the

improvement information generating unit comprises:

        a class tap constructing unit adapted to construct a class tap used for finding the class of

target teacher data of teacher data to be a teacher, by using learner data to be a learner;

        a classifying unit adapted to carry out classification for finding the class of the target

teacher data on the basis of the class tap;

        a prediction tap constructing unit adapted to construct a prediction tap used together with

a prediction coefficient for predicting the target teacher data, by using the learner data; and

a prediction coefficient operation unit adapted to find a prediction coefficient for each

class by using the teacher data and the prediction tap.

48.   (Previously Presented) The data processing device as claimed in claim 47, wherein the

improvement information generating unit generates prediction coefficients for different numbers

of classes as the plurality of types of improvement information.

49.   (Previously Presented) The data processing device as claimed in claim 47, wherein the

improvement information generating unit generates a plurality of types of prediction coefficients

found by using learner data or teacher data of different qualities, as the plurality of types of

improvement information.

50.   (Previously Presented) The data processing device as claimed in claim 47, wherein the

improvement information generating unit generates at least the prediction coefficient and

information for carrying out linear interpolation, as the plurality of types of improvement

information.

51.   (Previously Presented) The data processing device as claimed in claim 47, wherein the

improvement information generating unit generates a plurality of types of prediction coefficients

found by using class taps or prediction taps of different structures, as the plurality of types of

improvement information.

52.   (Previously Presented) The data processing device as claimed in claim 47, wherein the

improvement information generating unit generates a plurality of types of prediction coefficients

found by carrying out classification by different methods, as the plurality of types of

improvement information.

53.   (Previously Presented) The data processing device as claimed in claim 41, wherein the

transmitting unit embeds the improvement information into the data so that the data and the

improvement information can be restored, by using the bias of energy held by the data, and

transmits the data and one or more types of improvement information.

54.   (Previously Presented) The data processing device as claimed in claim 41, wherein the

transmitting unit embeds the improvement information into the data by carrying out spectrum

spreading and transmits the data and one or more types of improvement information.

55.   (Previously Presented) The data processing device as claimed in claim 41, wherein the

transmitting unit embeds the improvement information into the data by changing one or more

bits of the data to the improvement information and transmits the data and one or more types of

improvement information.

56.   (Previously Presented) The data processing device as claimed in claim 41, wherein the

transmitting unit transmits the data and all the plurality of types of improvement information.

57.   (Original) The data processing device as claimed in claim 41, wherein the data is image

data and the improvement information is information for improving the image quality of the

image data.

58.   (Currently Amended) A data processing method comprising:

        an improvement information generating step of generating a plurality of types of

improvement information for improving quality of data, wherein the plurality of types of

improvement information convert the data into a plurality of qualities;

        an improvement information selecting unit adapted to select improvement information to

be transmitted together with the data, from the plurality of types of improvement information,

wherein one of the plurality of types of improvement information is embedded into the data; and;

        a transmitting step of transmitting the data and said one of the plurality of types of

improvement information and,

        wherein said one of the plurality of types of improvement information is embedded into

the data so that the data and the improvement information can be restored.

59.   (Currently Amended) A recording medium having recorded thereon a program to be

executed by a computer, the program comprising:

an improvement information generating step of generating a plurality of types of

improvement information for improving the quality of data, wherein the plurality of types of

improvement information convert the data into a plurality of qualities;

an improvement information selecting unit adapted to select improvement information to

be transmitted together with the data, from the plurality of types of improvement information,

wherein one of the plurality of types of improvement information is embedded into the data; and;

a transmitting step of transmitting the data and said one of the plurality of types of

improvement information and,

wherein said one of the plurality of types of improvement information is embedded into

the data so that the data and the improvement information can be restored.

60.   (Cancelled)

61.   (Previously Presented) A data processing device comprising:

an improvement information generating unit adapted to generate improvement

information for improving quality of data; and

an embedding unit adapted to embed improvement information into the data, wherein the

embedding unit embeds the improvement information into the data so that the data and the

improvement information can be restored, by using a bias of energy held by the data.

62.   (Previously Presented) A data processing device for processing embedded data obtained

by embedding improvement information for improving quality of data into the data, the device

comprising:

an extracting unit adapted to extract the improvement information from the embedded

data; and

an improving unit adapted to improve the quality of the data by using the improvement

information, wherein the extracting unit extracts the improvement information from the

embedded data by using the bias of energy held by the data.

63.   (Previously Presented) A data processing device comprising:

an improvement information generating unit adapted to generate a plurality of types of

improvement information for improving quality of data;

an improvement information selecting unit for selecting improvement information to be

transmitted together with the data, from the plurality of types of improvement information; and

a transmitting unit adapted to transmit the data and one or more types of improvement

information, wherein the improvement information selecting unit selects the improvement

information in response to a request from a receiving device which receives the data.

64.   (Previously Presented) A data processing device comprising:

an improvement information generating unit adapted to generate a plurality of types of

improvement information for improving quality of data;

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an improvement information selecting unit for selecting improvement information to be transmitted together with the data, from the plurality of types of improvement information;

a transmitting unit adapted to transmit the data and one or more types of improvement information; and

an accounting unit adapted to carry out accounting in correspondence with the improvement information selected by the improvement information selecting unit, wherein the improvement information selecting unit selects the improvement information in response to a request from a receiving device which receives the data.

65.   (Previously Presented) A data processing device comprising:

an improvement information generating unit adapted to generate a plurality of types of improvement information for improving quality of data; and

a transmitting unit adapted to transmit the data and one or more types of improvement information, wherein the transmitting unit embeds the improvement information into the data so that the data and the improvement information can be restored, by using the bias of energy held by the data, and transmits the data and one or more types of improvement information.

66.   (New) A data processing device comprising:

an improvement information generating unit adapted to generate a plurality of types of improvement information for improving quality of data based on either receiving a selecting

signal at a transmitting device or receiving, at the transmitting device, a request from a receiving

device which receives the data; and

an embedding unit adapted to embed the plurality of types of improvement information

into the data, wherein the improvement information generating unit generates the plurality of

types of improvement information for converting the data into a plurality of qualities, and

wherein the embedding unit embeds the plurality of types of improvement information

into the data so that the data and the improvement information can be restored.

67.   (New) A data processing method comprising:

an improvement information generating step of generating a plurality of types of

improvement information for improving quality of data based on either receiving a selecting

signal at a transmitting device or receiving, at the transmitting device, a request from a receiving

device which receives the data; and

an embedding step of embedding the plurality of types of improvement information into

the data, wherein the improvement information generating step generates the plurality of types of

improvement information for converting the data into a plurality of qualities and,

wherein the embedding step embeds the plurality of types of improvement information

into the data so that the data and the improvement information can be restored.

68.   (New) A recording medium having recorded thereon a program to be executed by a

computer, the program comprising:

an improvement information generating step of generating a plurality of types of

improvement information for improving quality of data based on either receiving a selecting

signal at a transmitting device or receiving, at the transmitting device, a request from a receiving

device which receives the data; and

an embedding step of embedding the plurality of types of improvement information into

the data, wherein the improvement information generating step generates the plurality of types of

improvement information for converting the data into a plurality of qualities and,

wherein the embedding step embeds the plurality of types of improvement information

into the data so that the data and the improvement information can be restored.